DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC
20332-5000

04 MAR 1987

REPLY TO
ATTN OF: LEEE

SUBJECT: Engineering Technical Letter (ETL) 87-2:
Volatile Organic Compounds

TO:

ALMAJCOM/DEE/DEP	AFRCE-WR	AFRCE-CR	AFRCE-ER
AFRCE-BMS	AFRCE-SAC	AFIT/DET/DEM	HQ AFCC/DEM
HQ AFRES/DE	AAFES/ENC	ANGSC/DEE	HQ AFESC/DEM
NAVFAC Code 04/05	1100 ABG/DE	DAEN-ECE-S	

1. Purpose: This letter provides guidance on coating systems that comply with air quality regulations pertaining to volatile organic compounds (VOC).

2. Effective Date: Immediately.

3. Referenced Publications: This ETL is authorized in accordance with AFR 8-7, Air Force Engineering Technical Letter (ETL) dated 9 January 1986, which is directive in nature and requires compliance with ETLs. Other applicable publications are as follows:

a. AFM 85-3, Paints and Protective Coatings.

b. APR 88-15, Criteria and Standards for Air Force Construction.

c. National Bureau of Standards (NBS) Report NBSIR 86-3499 (USAF), December 1986.

4. Description/Implementation: The coating systems listed in Section 1 of this ETL meet the VOC requirements of the California South Coast Air Quality Management District Rule 1113. These systems are recommended for use at Air Force installations, when appropriate. NBSIR 86-3499 (USAF) (Section 2 of this ETL) provides background information on the recommended systems listed in Section 1.

5. AFM 85-3 will be revised to include these coating systems.

6. Action officer for this ETL is Mr C.E. Myers, HQ AFESC/DEMM, AV 970-6351.

FOR THE CHIEF OF STAFF

WILLIAM A. BROWN, SR
Acting Chief, Engineering Division
Directorate of Engr & Svcs

3 Atch
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82-6	Normal Passive Solar Applications	30 Dec 82
82-7	Unique Passive Solar Applications	30 Nov 82
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83-4	EMCS Data Transmission Media (DTM) Considerations	3 Apr 83
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ENGINEERING TECHNICAL LETTERS (ETL)

SECTION A - CURRENT ETLs

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86-17	Power Conditioning and Continuation Interfacing Equipment (PCCIE)	17 Dec 86
86-18	Heat Distribution Systems Outside of Buildings	24 Dec 86
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87-2	Volatile Organic Compounds	04 Mar 87

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82 - 5	10 Nov 82	Superseded by ETL 84 - 1
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84 - 1	18 Jan 84	Superseded by ETL 86 - 13
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ABSTRACT

The potential impact of the Federal Clean Air Act upon coating specifications recommended in AFM 85-3, Tri-Service Paints and Protective Coatings Manual, for the maintenance of Air Force Facilities is assessed. The weight of the volatile organic component of each paint and recommendations of the coordinating activity are listed. Substitute coating specifications are recommended for noncompliant ones when possible.

Keywords: Coating, paints, volatile organic compound, Tri-Service Paints and Protective Coatings Manual, AFM 85-3

ACKNOWLEDGEMENT

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1. INTRODUCTION

1.1 Background

Selection and use of coating systems for maintenance of facilities are subject to many constraints, including federal and local environmental regulations. Recommendations regarding selection and use should help users choose proper systems that are in compliance with all regulations. Recent and upcoming changes in environmental regulations associated with the Clean Air Act may bring about major changes in government coating specifications and consequently in recommended coating systems for maintenance of facilities.

The Clean Air Act of 1970, amended in 1977, gives the Environmental Protection Agency (EPA) the responsibility for establishing air quality standards for pollutants that may harm the public health and welfare. EPA has set national ambient air quality standards for six major pollutants. The pollutant of interest in this discussion is ozone, since ozone concentration in the air is directly related to the presence of organic materials in the air, including those produced by the drying and curing of coatings [1]. According to the law, the entire country must meet the requirements of the Clean Air Act, including the ozone level, by December 31, 1987. Currently, about 10 percent of U.S. counties have not attained the standard for ozone, and those counties contain virtually all of the major U.S. urban areas [2]. Thus, both federal and local environmental agencies are stepping-up enforcement of regulations involving emission of organic materials, including those from coatings, and are considering additional regulations that may lower the allowable amount of volatile

organic content (VOC) of coatings. These actions have resulted in the need for review and possible revision of federal government coating specifications.

1.2 Objectives and Scope

This report was prepared at the request of the Air Force Engineering and Services Center to help assess the impact of VOC regulations on the selection and use of coatings recommended for maintenance of facilities as given in the Tri-Service Paints and Protective Coatings Manual (AFM 85-3) [3]. The objectives of the report are to l) list the VOC content of all coatings recommended in AFM 85-3, 2) divide the coatings into groups according to compliance with the more restrictive controlling regulations, such as California's South Coast Air Quality Management District's Architectural Rule 1113, and their Coating of Metal Parts and Products Rule 1107, 3) suggest alternatives, to the extent possible, for the non-compliant coatings, ant 4) list generic types of materials for which purchasing documents are needed. This report will not discuss compliance with other regulations that also may affect some government coating operations.

This report is intended to give guidance for the selection and use of compliant coatings. However, it must be noted that there are many regulations, both local and federal, governing the VOC of coatings and that they vary from region to region within the country. Thus, when there is doubt about the compliance of a material for a specific use, local environmentalists should be consulted.

This review of government coating specifications for compliance with California rules also provides a unique opportunity to increase our understanding of the needs of users for performance data, as well as selection and use criteria for new materials.

2. STATUS OF COATING SPECIFICATIONS IN MANUAL

2.1 Rules Governing VOC of Coatings

2.1.1 Background

Before discussing specific rules governing the volatile organic compounds (VOC) of coatings, a little history on the development of the rules is presented to aid in the understanding of their effect on government coating specifications. As a result of the Clean Air Act as amended in 1977, EPA required all states in non-attainment of the ozone limit of the National Ambient Air Quality Standards to revise their State Implementation Plans for control of ozone. To help the states with their plans for lowering the VOC of coatings, EPA published a series of Control Techniques Guideline (CTG) documents containing EPA's recommendations for control of eleven specific end-use surface coating operations and VOC of related materials [4]. The eleven end-use coating categories addressed by CTGs include automotive and light-duty trucks, can, coil, metal furniture, large appliance, fabric, paper, magnetic wire, metal parts and products, flatwood paneling, and graphic arts. Thirty-five states, or portions thereof (called regions in this report), adopted coating regulations, based on these recommendations. These regulations affect some DoD coating operations, such as

those involving airplanes, mobile equipment and, to some extent, ships. In addition to these eleven end-uses, some regions of California also control the VOC of architectural coatings, including those used for coating maintenance of facilities. Currently, no other regions in the country control the VOC of architectural coatings. However, other regions of the country are considering control of VOC of architectural coatings and EPA has proposed consideration of a CTG for architectural coatings [5].

To help establish the extent of the problem regarding compliance of government specification coatings with environmental regulations, the Department of Defense through the Office of the Secretary of Defense, tasked Fort Belvoir's Research, Development and Engineering Center with developing information on the compliance status of each specification coating included in the Federal Supply Schedule, FSC 8010 [6]. Work in this task included determining the VOC of each coating defined by a federal specification and recommending action for each specification which does not comply. To meet the requirements of the task, the Fort Belvoir Center requested each government activity responsible for coordinating government coating specifications to report to the Center the following information for each specification: l) document number, 2) document title, 3) VOC, 4) coating type and use, 5) will it be cancelled, 6) will it be designated for revision, 6) and proposed action to reduce VOC content.

Since compliance of a coating depends both upon the region of the country in which the coating is used and the end-use, the most restrictive rules were used as a measure of compliance by the Fort Belvoir Center, reasoning that if a coating were compliant with the most restrictive rules, it would be compliant for use

in any region. Since California's rules are considered to be the most restrictive of all U.S. rules, this resulted in the use of its rules as the measure of compliance. In most instances, the Fort Belvoir Center used the South Coast Air Quality Management District's (SCAQMD) Coating of Metal Parts and Products Rule 1107 as the measure of compliance. In some cases, the specification coordinating activity used the SCAQMD's Architectural Coatings Rule 1113 as a measure of compliance [6].

A similar measure of compliance was used in this report since one of the recommendations for the Office of the Secretary of Defense [6] was that all federal specifications should comply with the most restrictive environmental rules. The most restrictive rules applicable to facility maintenance painting appear to be the SCAQMD Rules œor metal parts and products (Rule 1107) and architectural coatings (Rule 1113) and they are used as a measure of compliance in this report. Copies of these rules, Architectural Coatings Rule 1113 and Coating of Metal Parts and Products Rule 1107, are reproduced in Appendix A to this report.

In addition to the diversity of the rules that may apply to coating operations, rules are often somewhat difficult for coating users to interpret. For example, in SCAQMD's Architectural Coating Rule there are two general categories of coatings: architectural coatings and architectural specialty coatings. Neither category is defined specifically in the rule. From conversations with people representing industry [1] and the government [2], it appears that the usual

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[1] Personal conversation with Raymond Connor, National Paint and Coatings Association, October 1986.

interpretation of the rule is that architectural coatings are those generally thought of as trade-sales by the industry (with the exception of varnishes, lacquers, and stains) and specialty architectural coatings are all other architectural coatings. In addition, some coating types, such as vinyl lacquers, could fall under more than one classification within the rule, each having a different VOC limit.

2.1.2 Rule Requirements

The VOC requirements of SCAQMD Rules 1113 and 1107 are listed below. The SCAQMD's Architectural Rule 1113 requires, for flat coatings, a VOC of less than or equal 250 grams/liter (g/l) (2.1 pounds/gal), excluding water and any colorant added to tint bases. The present SCAQMD Architectural Rule limit for non-flat coatings is 380 g/l (3.2 pounds/gal). According to the rule as amended Nov. 1, 1985, this limit for non-flat coatings will be changed to 250 g/l September 2, 1989. However, EPA, Region 9, has informed SCAQMD that they intend to publish a notice of disapproval of this amendments [3]. If such a notice is issued, the allowable VOC limit for non-flat coatings would be decreased to 250 g/l at an earlier date than September 2, 1989. EPA rulings would appear in the Federal Register.

For specialty coatings, the VOC limits of SCAQMD's Architectural Coating Rule 1113 vary depending upon the type (both generic and functional) of the

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[3] Personal conversation with Raymond Connor, National Paint and Coatings Association, October, 1986.

coating. Effective September 1, 1987, a maximum VOC will apply to each type of coating. At that time, most industrial maintenance-type coatings will have a VOC limit of 420 g/l (3.5 pounds/gal). Other limits will range from 250 g/l (2.08 pounds/gal) for traffic paints to 680 g/l (5.67 pounds/gal) for lacquers.

The VOC limits for coatings used under the SCAQMD's Coating of Metal Parts and Products Rule 1107 are 340 g/l (2.8 pounds/gal) for air-dry coatings and 275 g/l (2.3 pounds/gal) for baked coatings.

2.2 VOC of Coatings in AFM 85-3

With the exception of a few specifications (marked with a "*"), the VOC of coatings recommended for use in the Tri-Service Paints and Protective Coatings Manual, AFM 85-3, was obtained from a draft report prepared by Port Belvoir's Research, Development and Engineering Center for the Office of the Secretary of Defense [6]. For specifications marked with a "*", the VOC was calculated using weight requirements of the specification. Along with the VOC of each coating, the recommendations and comments of the coordinating activities concerning the specification as stated in the Fort Belvoir report are listed in Table 1. Action on these recommendations by user activities has not been taken as of December 1, 1986. (Materials recommended for use in the Manual [3] not covered by the rules, such as putties, resins, etc. are not included in the table.)

Table 1. VOC of Coating Specifications Used in Tri-Service Coatings
Paints and Protective Coatings Manual

NUMBER	VOC, g/1	MEET VOC RULES		RECOMMENDATIONS AND REMARKS OF
		1113	1107	SPECIFICATION COORDINATING ACTIVITY
A-A-8	UNAVAILABLE	YES		EXEMPT UNDER RULE SCAQMD 1113, c2H
A-A-1500	250	YES	YES	
A-A-1572	780	NO	NO	REVISE SPECIFICATION
A-A-2246	250	YES	YES	
A-A-2247	250	YES	YES	
A-A-2248	250	YES	YES	
A-A-2335	580	NO	NO	CANCEL SPECIFICATION
A-A-2336	420	YES	NO	
A-A-2340	250	YES	YES	
SS-W-lIO	UNAVAILABLE			
TT-C-492	720	NO	NO	REVISE SPECIFICATION
TT-C-498*	600	NO	NO	
TT-C-499	750	NO	NO	REVISE SPECIFICATION
TT-C-535, I	UNAVAILABLE			EXEMPT UNDER SCAQMD RULE 1113 WHEN CALLED TILE-LIKE COATING
TT-C-535, II	UNAVAILABLE			EXEMPT UNDER SCAQMD RULE 1113 WHEN CALLED TILE-LIKE COATING
TT-C-542, I	500	NO	NO	
TT-C-542, II	420	YES	NO	
TT-C-55O				SPECIFICATION HAS BEEN CANCELLED
TT-C-555	250	YES	YES	EXEMPT UNDER SCAQMD RULE 1113, c2C
TT-C-1060	UNAVAILABLE	YES		EXEMPT UNDER SCAQMD RULE 1113, c2I
TT-C-1951	250	YES	YES	
TT-E-485	480	NO	NO	
TT-E-487	458	NO	NO	REVISE SPECIFICATION
TT-E-489	480	NO	NO	FORT BELVOIR IS REFORMULATING
TT-E-490	450	NO	NO	CANCEL SPECIFICATION
TT-E-496	500	NO	NO	REVISE SPECIFICATION
TT-E-505	420	NO	NO	
TT-E-506	420	NO	NO	
TT-E-508	420	NO	NO	
TT-E-509	372	NO	NO	REVISE SPECIFICATION
TT-E-522	576	NO	NO	
TT-E-543A	398	NO	NO	CANCEL SPECIFICATION
TT-E-545	410	NO	NO	REVISE SPECIFICATION
TT-E-1384	523	NO	NO	CANCEL SPECIFICATION
TT-E-1593	523	NO	NO	CANCEL SPECIFICATION

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*VOC calculated

Table 1 Cont. VOC of Coating Specifications in Tri-Service Coatings
Paints and Protective Coatings Manual

NUMBER	VOC. g/1	MEET VOC RULES		RECOMMENDATIONS AND REMARKS OF
		1113	1107	SPECIFICATION COORDINATING ACTIVITY
TT-E-1793	690	NO	NO	
TT-F-336	UNAVAILABLE			
TT-F-340	UNAVAILABLE			
TT-F-1098	UNAVAILABLE			
TT-P-19	250	YES	YES	
TT-P-24	420	NO	NO	
TT-P-25	290	YES	YES	
TT-P-26	UNAVAILABLE	YES		EXEMPT UNDER SCAQMD RULE 1113, c2A
TT-P-28	530	NO		
TT-P-29	240	YES	YES	
TT-P-30	500	NO	NO	CANCEL SPECIFICATION
TT-P-31	132	YES	YES	
TT-P-37	460	NO	NO	CANCEL SPECIFICATION
TT-P-47	420	NO		
TT-P-38*	520	YES	NO	EXEMPT UNDER SCAQMD RULE 1113, c2D
TT-P-52	420	NO	NO	
TT-P-81	420	NO	NO	
TT-P-85	420	NO	NO	REVISE SPECIFICATION
TT-P-86	200-396	YES	YES	
TT-P-87	460	NO	NO	CANCEL SPECIFICATION
TT-P-87	460	NO	NO	CANCEL SPECIFICATION
TT-P-91	528	NO	NO	REVISE SPECIFICATION
TT-P-95	720		NO	EXEMPT UNDER SCAQMD RULE 1113 FOR SWIMMING POOL USE, OTHERWISE DOES NOT MEET RULE 1113
TT-P-96	250	YES	YES	
TT-P-97	530	NO	NO	CANCEL SPECIFICATION
TT-P-102	420	NO	NO	
TT-P-lIO	460	NO	NO	REVISE SPECIFICATION
TT-P-115	410	NO	NO	CANCEL SPECIFICATION
TT-P-320	NONE	YES	YES	
TT-P-381		YES		EXEMPT UNDER SCAQMD RULE 1113
TT-P-595		YES		EXEMPT UNDER SCAQMD RULE 1113
TT-P-615	480	NO	NO	CANCEL SPECIFICATION
TT-P-620	420	NO	NO	
TT-P-641	420	YES	NO	EXEMPT UNDER SCAQMD RULE 1113, c2D

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*VOC calculated

Table 1 Cont. VOC of Coating Specifications in Tri-Service Coatings Paints and Protective Coatings Manual

NUMBER	VOC. g/l	MEET VOC RULES		RECOMMENDATIONS AND REMARKS OF SPECIFICATION COORDINATING ACTIVITY
		1113	1107	
TT-P-645	444	NO	NO	REVISE SPECIFICATION
TT-P-650	250	YES	YES	
TT-P-659	480	NO	NO	CANCEL SPECIFICATION
TT-P-1046	520	YES	NO	EXEMPT UNDER SCAQMD RULE 1113, d2D
TT-P-1181*	480	NO	NO	
TT-P-1385	450	NO	NO	CANCEL SPECIFICATION
TT-P-1411	460	NO	NO	CANCEL SPECIFICATION
TT-P-1510	250	YES	YES	
TT-P-1511	250	YES		
TT-P-1565	380	YES	NO	
TT-P-1728	250	YES	YES	
TT-P-1757*	490	NO	NO	
TT-P-1952	250	YES	YES	
TT-P-1984	250	YES	YES	
TT-P-2118	VARIES	NO	NO	CANCEL SPECIFICATION
TT-P-2119	250	YES	YES	
TT-S-176	520	NO	NO	CANCEL SPECIFICATION
TT-S-179	486	NO	NO	REVISE SPECIFICATION
TT-S-l90	690	NO	NO	
TT-S-223	336	YES	YES	
TT-S-708	420	NO	NO	
TT-S-711	690	NO	NO	
TT-S-1992	250	YES	YES	
TT-V-51	530	NO	NO	CANCEL SPECIFICATION
TT-V-71	478	NO	NO	CANCEL SPECIFICATION
TT-V-81	> 430		NO	EXRMPT UNDER SCAQMD RULE 1113, c2D FOR USE AS MIXING VARNISH FOR AL PIGMENT
TT-V-85	690	NO	NO	
TT-V-86	490	NO	NO	
TT-V-109	370	NO	NO	
TT-V-119	370	NO	NO	REVISE SPECIFICATION
TT-V-121	410	NO	NO	CANCEL SPECIFICATION
DOD-E-698	445	NO	NO	CANCEL SPECIFICATION
DOD-E-699	415	YES	NO	CANCEL SPECIFICATION
DOD-E-700	450	NO	NO	CANCEL SPECIFICATION
MIL-C-4556	530,576	NO	NO	
MIL-C-5044*	480	NO	NO	
MIL-S-12935*	660	NO	NO	CANCEL SPECIFICATION

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*VOC calculated

Table 1 Cont. VOC of Coating Specifications in Tri-Service Coatings
Paints and Protective Coatings Manual

NUMBER	VOC. g/l	MEET VOC RULES		RECOMMENDATIONS OF SPECIFICATION
		1113	1107	COORDINATING ACTIVITY
MIL-P-14105*	400	YES	NO	
MIL-E-15145*	510	NO	NO	
MIL-C-15203	UNAVAILABLE			
DOD-C-15328	760	NO	NO	CANCEL SPECIFICATION
MIL-P-15930	700	NO	NO	CANCEL SPECIFICATION
MIL-E-18210	434	NO	NO	CANCEL SPECIFICATION
MIL-E-18214	420	YES	NO	CANCEL SPECIFICATION
MIL-C-18480	UNAVAILABLE			
MIL-P-20090	430	NO	NO	CANCEL SPECIFICATION
MIL-C-22750	552	NO	NO	
MIL-P-23377	552	NO	NO	TYPES 1 and 2
MIL-P-23377	350	YES	YES	TYPE 3
MIL-P-24351	445	NO	NO	REVISE SPECIFICATION
MIL-P-24441	<420	YES	NO	MIN ALLOWED SOLVENT In ALL
MIL-P-26915	540	YES	NO	EXEMPT UNDER RULE 1113, c2D
MIL-P-28577	250	YES	YES	
MIL-P-28578	250	YES	YES	
MIL-P-28582	445	NO	NO	REVISE SPECIFICATION
MIL-P-28641	710	NO	NO	REVISE SPECIFICATION
MIL-P-28642	710	NO	NO	REVISE SPECIFICATION
MIL-R-46073	REMOVER			
MIL-C-46081	THERMAL INSULATING			
MIL-P-52192	UNAVAILABLE			
MIL-P-52324				SPECIFICATION HAS BEEN CANCELLED
MIL-C-81346	470	NO	NO	REVISE SPECIFICATION
MIL-C-83286	575	NO	NO	REVISE SPECIFICATION
VR-3*	660	NO	NO	
VR-6*	660	NO	NO	
SSPC-11*	48	YES	YES	VOC CALCULATED FROM SPECIFICATION
SSPC-2*	504	NO	NO	VOC CALCULATED FROM SPECIFICATION
SSPC-5*	350	YES	NO	VOC CALCULATED FROM SPECIFICATION EXEMPT UNDER SCAQMD RULE 1113, c2D
SSPC-8*	720	YES	NO	EXEMPT UNDER SCAQMD RULE 1113, c2D
SSPC-I*	275	YES	YES	
SSPC-9*	685	NO	NO	
SSPC-15*	530	NO	NO	
SSPC-16*	540-770	NO	NO	
SSPC-18*	745	NO	NO	
SSPC-21*	395-480	NO	NO	
SSPC-25*	384	YES	NO	
SSPC-27*	760	NO	NO	

2.3 Selection Tables in Manual Showing SCAQMD Non-compliant Coatings

A summary of the coating specifications affected by the proposed changes in the specifications to meet SCAQMD Rules 1113 and 1107 are shown in Appendix B to this report. This summary was done using copies of the tables as they appear in Appendix D of AFM 85-3. All potentially affected specifications are enclosed in a box. The tables were not re-typed so that proposed changes in specifications upon the selection of coating systems could be easily noted. The legend for the "mark-up" of the tables is shown on each of the selection tables.

2.4 Proposed Replacements for Non-Compliant Coatings

A summary of the proposed replacement coating specifications for those that are not compliant with SCAQMD Rule 1113 is shown in Appendix C to this report. As for Appendix B, Appendix C follows the format of the selection tables in AFM 85-3. As can be noted, there are situations in which either replacement materials available are not available or only limited performance data is available for replacement materials that are defined by government specifications. Needs for additional performance criteria and government purchasing documents include:

- clear finishes (industry is having trouble supplying)
- stains for wood (industry is having trouble supplying organic-solvent based)

- latex coatings (commercial materials are available)
  interior: semigloss and gloss in mid - and deep tones
  exterior: semigloss and gloss in mid - and deep tones,
  flat in mid- and deep tones

- high solids epoxies (commercial materials are available, but need evaluation; Navy is working on a government specification)

- high solids urethane finish coat (commercial materials are available, but need evaluation)

- replacement for vinyls and rubbers for concrete/masonry in corrosive and wet environments (industry is having trouble supplying)

- replacement for wash primer (difficult to formulate replacement as presently supplied)

- high solids alkyds or other easy-to-recoat type of coating (industry is having trouble supplying)

- high solids coating for use on marginally prepared steel, such as epoxy mastics, to replace TT-P-645 (epoxy mastics are commercially available, but need evaluation; Navy is working on VOC compliant TT-P-645)

- improved latex maintenance systems for steel (commercial materials are available, but need evaluation)

As noted in the above list, there are many needs for additional purchasing documents and coating materials. Some VOC compliant coatings are commercially available but have not been recommended for use on military facilities because of limited performance data and lack of government purchasing documents. Other coatings are under development by industry and government. Although substitutions of these types of coatings will be necessary to comply with some VOC regulations, data on their requirements for surface preparation, application conditions, etc. are limited compared with the traditionally used materials. In addition, estimates of the service life of the new coatings for a particular application are likely to be less reliable than for the traditional coating systems.

3. RECOMMENDATIONS

New and current government environmental regulations are likely to have a major impact on the selection and use of coatings by facility engineers for coating maintenance of buildings and structures on their bases. To address the current and future problems, it is recommended that the following actions be taken within the Department of Defense:

- Clarify the DoD policy regarding compliance; that is, which rules should be controlling with respect to facility painting

- Develop purchasing documents for all materials listed in 2.4 for which there are commercially available materials and support work to develop materials and write purchasing documents for those that are not presently available

- Establish a task force with representatives from all branches of DoD so as to achieve 1) sustained awareness of new and forthcoming regulations and performance of new materials, 2) generic purchasing documents for materials that are available on the commercial market but for which there are no government purchasing documents, 3) frequent interaction of government personnel involved in coating research and development, specification development, purchase, and use, and 4) use of the best available coatings data in purchasing documents, guide specifications, manuals, and the like.

- Although the EPA has exempted certain halogenated hydrocarbons from air pollution regulations because they have not been shown to be precursors of ozone formation, it is recommended that substitution of these solvents in coatings defined by federal specifications not be supported. Substitution of these solvents may affect structural integrity, water pollution, health and safety in the workplace, waste disposal, etc.

- Support research to develop test methods to predict performance of new VOC compliant coatings and to further understand the critical parameters involved in the use of these coatings (e.g., surface preparation, application, thickness, etc.).

4. CONCLUSIONS

The Clean Air Act requires that all regions of the country meet the National Air Quality Standard by December 31, 1987. Since nearly every major metropolitan region is in a non-attainment area for ozone, EPA may recommend more stringent controls of VOC of paints and coatings.

The impact of using only coating materials that comply with California's SCAQMD Rule 1113 on the recommendations for maintenance of military facilities is shown in Appendix B. As is readily evident, recommendations have been made for cancellation or change of a major portion of the specifications used in the selection tables in AFM 85-3 (i.e., those enclosed by boxes in the tables in Appendix B).

Because of these proposed extensive changes in coating specifications, there is an urgent need to predict or determine the performance of low VOC coatings, understand critical parameters affecting their performance, develop purchasing documents, make recommendations for selection and use of these materials as contained in guide specifications and manuals, and keep abreast of current and proposed regulations.

5. REFERENCES

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Appendix A. California South Coast Air Quality Management District Architectural Coatings Rule 1113 and Coating of Metal Parts and Products Rule 1107

(Adopted Sept. 2, 1977)(Amended Dec. 2, 1977)(Amended Feb. 3, 1978)
(Amended Sept. 5, 1980)(Amended Apr. 3, 1981)(Amended July 3, 1981)
(Amended by the Calif. ARB Oct. 21, 1981)(Amended Aug. 5, 1983)
(Amended Mar. 16, 1984)(Amended Aug. 2, 1985)(Amended Nov. 1, 1985)

RULE 1113. ARCHITECTURAL COATINGS

(a) (1) A person shall not sell, offer for sale, or apply any architectural coating manufactured after December 31, 1981 which:

(A) contains more than 250 grams of volatile organic compounds per liter of coating (2.08 pounds per gallon) excluding water and any colorant added to tint bases, except as provided in subsection (a)(2) or

(B) contains more than 380 grams of volatile organic compounds per liter of coating (3.17 pounds per gallon) excluding water and any colorant added to tint bases, is defined as a non-flat coating and is manufactured prior to September 2, 1989.

(C) is recommended for use as a bituminous pavement sealer unless it is an emulsion-type coating.

(2) A person shall not sell, offer for sale or apply any architectural specialty coating which exceeds the following limits (expressed as grams of VOC per liter of coating as applied, excluding water) manufactured after the date listed below:

	Effective Sept. 1, 1984	Effective Sept. 1, 1986	Effective Sept. 1, 1987
Varnish	500	---	350
Lacquer	---	---	680
Semi-transparent Stains	---	---	350
Opaque Stains	---	---	350
Semi-transparent and Clear Wood Preservatives	---	---	350
Opaque Wood Preservatives	400	---	350
General Primers, Sealers and Undercoaters	400	---	350
Specialty Primers, Sealers, and Undercoaters	---	---	350
Industrial Maintenance Primers and Topcoats*			
Alkyds	500**	420	420
Catalyzed Epoxy	500**	420	420
Bituminous Coatings Materials	---	---	420
Inorganic Polymers	---	---	420
Vinyl Chloride Polymers	---	---	420
Chlorinated Rubber	---	---	420
Acrylic Polymers	---	420	420
Urethane Polymers	---	420	420
Silicones	---	---	420
Unique Vehicles	---	---	420

Dry Fog Coatings			
Flats	550	---	420
Non-Flats	420	---	400
Quick Dry Enamels	---	---	400
Specialty Flats	---	---	400
Waterproof Sealers	---	---	400
Concrete Curing Compounds	---	---	350
Roof Coatings	---	---	300
Waterproofing Mastic Coatings	---	---	300
Enamel Undercoaters	450	---	350
Traffic Paints			
For public streets and highways	415	---	250
For other surfaces	250	---	250
Black traffic coatings	---	---	250

*A coatings category is determined by the generic polymer component present in the finished product in the largest quantity by weight.
** This limit shall become effective on September 1, 1985.

(b) The provisions of section (a) of this rule shall not apply to architectural coatings sold in this district for shipment outside of this district or for shipment to other manufacturers for repackaging.

(c) The provisions of section (a) shall not apply to:
(1) architectural coatings supplied in containers having capacities of one liter or less.
(2) architectural coatings recommended by the manufacturer for use solely as one or more of the following:
(A) fire retardant coatings.
(B) tile-like glaze coatings.
(C) mastic textured coatings.
(D) metallic pigmented coatings.
(E) swimming pool paints.
(F) multi-color paints.
(G) quick dry primers, sealers and undercoaters.
(H) shellac.
(I) sign (graphic arts) coatings.
(J) bond breakers.
(K) below ground wood preservative coatings.
(L) dry fog coatings (until September 1, 1984).

(d) In order to maintain an exemption beyond December 31, 1983, a business granted in exemption pursuant to subsection (a)(2) and (c)(2) of this rule shall, within three months after the end of each calendar year, commencing with 1983, file with the Executive Officer a report on the annual sales in gallons in California of the following coatings:
(1) Specialty flat coatings,
(2) Quick dry enamels,
(3) Enamel undercoaters,

(4) Quick dry primers, sealers, and undercoaters,
(5) Specialty primers, sealers, and undercoaters.

(e) Containers for all coatings subject to section (a) shall display the date of manufacture of the contents or a code indicating the date of manufacture. The manufacturers of such coatings shall file with the Executive Officer of the District and the Executive Officer of the California Air Resources Board prior to September 2, 1981, an explanation of each code.

(f) If anywhere on all exempt coating container, or any sticker or label affixed thereto, or in any sales or advertising literature and indication is given that such exempt coating may be used or is suitable for use for any purpose other than those specifically provided for in section (c) of this rule, then the exemption provided for in said section (c) shall not apply to that coating.

(g) In any instance where more than one of the standards set forth in section (a) of this rule must be applicable, the most restrictive standard shall apply.

(h) A person shall not use, sell or offer for sale for use in the District, in containers of 0.94 liter (one quart) capacity or larger, any architectural coating containing photochemically reactive solvent, as defined in Rule 102. The provisions of this subsection shall not apply to those coatings in compliance with subsections (a)(1)(A), (B), and (a)(2) of this rule.

(i) A person shall not thin or dilute any architectural coating with a photochemically reactive solvent, except that thinning of coatings in compliance with subsections (a)(l)(A), (B), and (a)(2) of this rule is permissible if the volatile organic compound content of such coating after thinning does not exceed the limits specified in the applicable subsections.

(j) Containers for all coatings subject to the requirements of this rule shall carry a statement of the manufacturer's recommendation regarding thinning of the coating. This recommendation shall not apply to the thinning of architectural coatings with water. The recommendation shall specify that the coating, except Industrial Maintenance, is to be employed without thinning or diluting under normal environmental and application conditions, unless any thinning recommended on the label for normal environmental and application conditions does not cause a coating to exceed its applicable standard. The recommendation on Industrial Maintenance Coatings containers shall state that the coating may be thinned or diluted in the amounted needed to be compatible with the existing application and environmental conditions.
This section applies to coatings, except Industrial Maintenance, manufactured after January 1, 1985 and for Industrial Maintenance Coatings manufactured after January 1, 1986.

(k) The VOC content of coatings subject to the provisions of this rule shall be determined by the procedure outlined in Rule 107 after the coating has been thinned as recommended on the label for normal environmental and application conditions.

(l) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) Architectural Coatings

Any coatings applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.

(2) Below Ground Wood Preservatives

Heavy duty coatings formulated solely for the purpose of protecting below ground wood from decay or insect attack and which contain a wood preservative chemical registered by the California Department of Food and Agriculture. These coatings perform their function by penetrating into the wood.

(3) Bituminous Coatings Materials

Black or brownish coating materials, soluble in carbon disulfide, consisting mainly of hydrocarbons and which are obtained from natural deposits, or as residues from the distillation of crude petroleum oils, or of low grades of coal.

(4) Bond Breakers

Coatings whose sole purpose, when applied between layers of concrete, is to prevent the freshly poured top layer of concrete from bonding to the substrate on which it is poured.

(5) Concrete Curing Compounds

Coatings whose sole purpose is to retard the evaporation of water from the surface of freshly cast concrete, thereby strengthening it.

(6) Dry Fog Coatings

Coatings which are formulated so that when sprayed, overspray droplets dry before falling on floors and other surfaces.

(7) Enamel Undercoaters

Coatings which are designed to be applied to a new surface over a primer or over a previous coat of paint, in order to improve the seal, provide better adhesion and make a smooth base for non-flat coatings.

(8) Fire Retardant Coatings

Coatings designed to retard fires and which will significantly:

(A) reduce rate of flame spread on the surface of a material to which such a coating has been applied, or

(B) resist ignition when exposed to high temperatures, or

(C) insulate a substrate to which such a coating has been applied and prolong the time required to reach ignition temperature.

(9) Flat Coatings

Coating which register gloss less than 15 on an 85 deg. meter or less than five on a 60 deg. meter, or which is labeled as a flat coating.

(10) General Primers

Coatings which are intended to be applied to a surface to provide a firm bond between the substrate and subsequent coats.

(11) General Sealers

Coatings which are intended for use on porous substrates to protect the substrate, to prevent subsequent coatings from being absorbed by the substrate, or to prevent harm to subsequent coatings by materials in the substrate.

(12) General Undercoaters
Coatings which are designed to provide a smooth surface for subsequent coats.

(13) Graphic Arts Coatings (Sign Paints)
Coatings which are marketed solely for application to indoor and outdoor signs and include lettering enamels, poster colors and bulletin colors.

(14) Industrial Maintenance Primers And Topcoats
Coatings which are intended to be applied to a surface prior to the application of an industrial maintenance topcoat, to provide a firm bond between the substrate and subsequent coats and high performance coatings which are formulated for the purpose of heavy abrasion, water immersion, chemicals, corrosion, temperature, electrical or solvent resistance.

(A) Alkyds
Synthetic resins formed by the condensation of polyhydric alcohols with polybasic acids.

(B) Catalyzed Epoxy
Crosslinking resins made by the reaction of epixides with other materials such as amines, alcohols, phenols, carboxylic acids, and unsaturated compounds.

(C) Bituminous Coatings Materials
Black or brownish coating materials, soluble in carbon disulfide, consisting mainly of hydrocarbons and which are obtained from natural deposits, or any residues from the distillation of crude petroleum oils, or of low grades of coal.

(D) Inorganic Polymers
Substances whose principle structural features are made up on homopolar interlinkages between multivalent elements other than carbon. This does not preclude the presence of carbon-containing groups in the side branches, or as interlinkages between principle structure members. Examples of such polymers are ethyl and butyl silicates.

(E) Vinyl Chloride Polymers
Polymers made by the polymerization of vinyl chloride or copolymerization of vinyl chloride with other unsaturated compounds, the vinyl chloride being in greatest amount by weight.

(F) Chlorinated Rubber
Resin formed by the reaction of rubber with chlorine.

(G) Acrylic Polymers
Polymers resulting from the polymerization of derivatives of acrylic acids, including esters of acrylic acid, methacrylic acid, acrylonitrile, and their copolymers. Also known as acrylic resins and acrylate resins.

(H) Urethane Polymers
Coating vehicles containing a polyisocyanate monomer reacted in such a manner as to yield polymers containing any ratio,

proportion, or combination of urethane linkages, active isocyanate groups, or polyisocyanate monomer.

(I) Silicones
A resin containing silicon unlike organic resins, which all contain carbon. The basic structure of silicones consist of silicon-oxygen linkages.

(J) Unique Vehicles
Generic polymer components not defined by any of the preceding; e.g., hypalon, phenoxy.

(15) Lacquer
Clear or pigmented coatings formulate with nitrocellulose or synthetic resins to dry by evaporation without chemical reaction and to provide a quick drying, solid protective film.

(16) Mastic Texture Coatings
Coatings except waterproofing mastic coatings which are formulated to cover holes and minor cracks and to conceal surface irregularities.

(17) Metallic Pigmented Paints
Non-bituminous coatings which are formulated with metallic pigment.

(18) Multi-colored Coatings
Coatings which exhibit more than one color when applied and which are packaged in a single container and applied in a single coat.

(19) Non-flat Coatings
Coatings which register gloss of 15 or greater on a 85 deg. meter or five or greater on a 60 deg. meter, and which are identified on the label as a gloss, semigloss, or eggshell enamel coating.

(20) Opaque Stains
All stains that are not classified as semitransparent stains.

(21) Opaque Wood Preservatives
All wood preservatives not classified as semi-transparent wood preservatives.

(22) Quick Dry Primers and Sealers
Primers, sealers, and undercoaters which are intended to be applied to a surface to provide a firm bond between the substrate and subsequent coats and which are dry to touch in one-half hour and can be recoated in two hours (ASTM 1640).

(23) Quick Dry Enamels
Non-flat coatings which comply with the following:

(i) Shall be capable of being applied directly form the container by brush or roller under normal conditions, normal conditions being ambient temperatures between 60 deg. F and 80 deg. F;

(ii) When tested in accordance with ASTM D 1640 they shall: set to touch in two hours or less, dry hard in eight hours or less, and be tack free in four hours or less, dry hard in eight hours or less, and be tack free in four hours or less by the mechanical method test;

(iii) Shall have a 60 deg. dried film gloss of no less than 70.

(24) Roof Coatings
Coatings which are formulated for the sole purpose of preventing penetration of the substrate by water. These coatings include bituminous roof and waterproof mastic coatings.

(25) Semi-Transparent Stains
Coatings which are formulated to change the color of a surface but not conceal the surface.

(26) Semi-Transparent Wood Preservatives
Wood preservative stains which are formulated for the purpose of protecting exposed wood from decay or insect attack by the addition of wood preservative chemical registered by the California Department of Food and Agriculture, and which are formulated to change the color of a surface but not conceal the surface. These coatings perform their function by penetrating into the wood.

(27) Shellacs
Clear or pigmented coatings formulated with natural resins (except nitrocellulose resins), thinned with alcohol, and formulated to dry by evaporation without a chemical reaction and are intended to provide stain blocking properties as well as a solid protective film.

(28) Specialty Flat Products
Self-priming flat products used only to perform one of the following functions: repair fire, smoke, or water damage; neutralize odors; block stains; or coat acoustical materials without affecting their acoustical properties.

(29) Specialty Primers, Sealers, and Undercoaters
Primers, sealers and undercoaters used only to perform one of the following functions: repair fire, smoke or water damage; neutralize odor; block stains; block efflorescence; condition chalky surfaces; or coat acoustical materials without affecting their acoustical properties

(30) Swimming Pool Coatings.
Coatings specifically formulated to coat the interior of swimming pools and to resist swimming pool chemicals.

(31) Tile-like Glaze Coatings
Coatings which are formulated to provide a tough, extra durable coating system, which are applied as a continuous (seamless) highbuild film and which cure to a hard glaze finish.

(32) Varnishes
Clear or pigmented coatings formulated with various resins to dry by chemical reaction on exposure to air. These coatings are intended to provide a durable transparent or translucent solid protective film.

(33) Volatile Organic Compounds (VOC)
Compounds of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, methane, 1,1,1-trichloroethane, methylene chloride, and trichloro-trifluoroethane, which may be emitted to the atmosphere during the application of and/or subsequent drying or curing of coatings subject to this rule.

(34) Waterproofing Mastic Coatings
Weatherproof and waterproof coatings which are formulated to cover holes, minor cracks, and conceal surface irregularities and which are applied in thicknesses of at least 15 mils.

(35) Waterproofing Sealers
Coatings which are formulated for the sole purpose of preventing penetration of porous substrates by water.

(Adopted June 1, 1979) (Amended December 4, 1981)
(Amended May 7, 1982) (Amended December 2, 1983)
(Amended March 2, 1984)

RULE 1107. COATING OF METAL PARTS AND PRODUCTS

(a) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) Metal Parts and Products are any components or complete units fabricated from metal, except those subject to the coating provisions of other source specific rules of Regulation XI.

(2) Volatile Organic Compound (VOC) is any volatile compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, 1,1,1 trichloroethane, methylene chloride, trifluoroethane and chlorinated-fluorinated hydrocarbons.

(3) Transfer Efficiency is the ration of the weight or volume of coating solids adhering to an object to the total weight or volume, respectively, of coating solids used in the application process expressed as a percentage.

(4) Touch-Up is that portion of the coating operation which is incidental to the main coating process but necessary to cover minor imperfections.

(5) Repair is recoating portions of a previously coated product due to mechanical damage to the coating following normal painting operations.

(6) Metallic Coating is a coating which contains more than 10 grams per liter (0.08 pound per gallon) of metal particles, as applied.

(7) Extreme Performance Coating is a coating designed for harsh exposure or exposure to any of: the weather all of the time, temperature consistently above 95 deg. C, detergents, abrasive and scouring agents, solvents, corrosive atmospheres or similar environmental conditions.

(8) Primary Architectural Coating is a coating used to protect architectural subsections after manufacture, until their assembly and coating is part of an architectural project.

(9) High Performance Architectural Coating is used to protect architectural subsections and meets the requirements of Architectural Aluminum Manufacturer's Association publication number AAMA 605.2-1980.

(10) Camouflage Coating is a coating used, usually by the military, to conceal equipment from detection.

(11) Military Specification Coating is a coating applied to metal parts and products which has a paint formulation approved by a United States Military Agency for use on Military equipment.

(12) Stencil coating is a coating applied to a template in order to add designs, letters and/or numbers to metal parts and products.

(13) Pretreatment Coating is a coating, which contains a small quantity of acid to provide surface etching, applied directly to metal surfaces to provide corrosion resistance, adhesion and ease of

year 1983 shall submit to the Executive Officer a Coatings Demonstration Plan to be used in establishing an 18-month program to demonstrate the feasibility of applying such coatings which meet the VOC limitations in subparagraph (b)(6)(E).

(B) Such plan shall include strategies to demonstrate the feasibility of the limits in subparagraph (b)(6)(E).

(C) Demonstration plan results shall be reported to the Executive Officer at the end of each three-month period of operation

(D) Tests run pursuant to an approved demonstration program, and with prior notification to the Executive Officer, shall not constitute a violation of any permit to operate.

(E) Intended Final Limits

(i) 340 grams VOC per liter of coating, as applied, excluding water, when the coated products are dried at a temperature of 90 deg. C (194 deg. F) or below;

(ii) 275 grams VOC per liter of coating, as applied, excluding water, when the coated products are dried at a temperature at or above 90 deg.C (194 deg. F).

(c) Equivalency

In lieu of complying with the specific limits of paragraph (b), a person may achieve compliance by means of an equivalency under this paragraph. To achieve equivalency, the emissions from the coating operation must be reduced, such that:

(1) The emission reductions are at least equal to those which would be obtained by the use of coatings and operational techniques specified in paragraph (b), and

(2) The emission reduction methods are applied to the coating operations subject to the provisions of this rule and such emission reduction methods are approved by the Executive Officer, and

(3) The owner or operator submits applications for new permits to construct or operate both basic and control equipment involved in such reductions, and

(4) Such emission reductions will occur by the applicable date specified in paragraph (b) for such compliance.

(d) Methods of Analysis

The volatile organic content of coatings subject to the provisions of this rule shall be determined by the procedure outlined in Rule 107.

(e) Exemptions

(1) The provisions of this rule, except for paragraph (f), shall not apply to:

(A) Touch-up and repair

(B) Metallic coatings

(C) Stencil coatings

(D) Until January 1, 1985, a facility which emits a total of less than 22.7 kilograms (50 pounds) of volatile organic compound from coatings subject to this rule in any one day or emits less than 226.8 kilograms (500 pounds) of

volatile organic

complying with (A) above; and

(C) submits to the Executive Officer, and receives approval of, a petition which describes the basis for exemption from subparagraph (b)(6).

(f) Rule 442 Applicability

Any coating, coating operation, or facility which is subject to this rule, shall comply with the provisions of the Rule 442 until such time compliance with the limits specified in this rule is achieved. Any coating, coating operation, or facility which is exempt from all or a portion of this rule, shall comply with the provisions of Rule 442.

(g) Compliance Schedules

(1) Any person who has not by January 1, 1982, either achieved compliance with the requirements of subparagraph (b)(5) of this rule, or achieved equivalency pursuant to paragraph (c), shall comply with the following:

(A) No later than January 1, 1982, submit a report to the District describing the techniques which will be used for achieving compliance with the requirements of said subparagraph; and

(B) No later than July 1, 1982, submit to the District copies of equipment purchases and/or construction contracts to enable compliance with the requirements of said subparagraph; and

(C) No later than September 1, 1982, submit to the District a certification that the necessary equipment has been installed and/or construction has been completed to enable compliance with the requirements of said subparagraph; and

(D) No later than January 1, 1983, submit to the District evidence demonstrating final compliance with the requirements of said subparagraph.

(2) Any person who has not by January 1, 1983, either achieved compliance with the requirements of subparagraphs (b)(3) and (b)(4)(A) of this rule, or achieved equivalency pursuant to paragraph (c) shall comply with the following:

(A) No later than January 1, 1983, submit a report to the District describing the techniques which will be used for achieving compliance with the requirements of said subparagraphs; and

(B) No later than July 1, 1983, submit to the District copies of equipment purchases and/or construction contracts to enable compliance with the requirements of such subparagraph; and

(C) No later than September 1, 1983, submit to the District a certification that the necessary equipment has been installed and/or construction has been completed to enable compliance with the requirements of said subparagraph; and

(D) No later than January 1, 1984, submit to the District evidence demonstrating final compliance with the requirements of said subparagraph.

(3) Any person who is subject to the provisions of paragraph (b)(6) of this rule shall comply with the following:

(A) No later than June 1, 1984, submit a Coatings Demonstration Plan for approval by the Executive Officer.

Appendix B. Summary of AFM 85-3 Coating Recommendations Affected by SCAQMD Rule 1113

TABLE 9. Recommended Coating Systems for Interior Wood

Use	Finish	Binder type(s)	Primer	Topcoat*	Notes
General Purpose ..	Clear	Oleo.....	TT-V-85[7]	TT-V-85[7]	Flat finish.
		Alkyd	TT-V-109[*]	TT-V-109[*]	Gloss finish, good film clarity.
		Urethane	TT-C-540	TT-C-540	Tough, durable gloss finish, but less film clarity than TT-V-109.
	Stain	Oil	TT-S-711[7]	Any of above	
	Semigloss	Alkyd	TT-E-529	TT-E-508[7]	White and tints.
		Alkyd + latex ...	TT-E-529	TT-P-1511	Type I: White and tints.
	Gloss		TT-E-543	TT-E-504	White and tints.
			TT-E-543	TT-E-489	Wide range of colors, fast dry.
		Alkyd + latex ...	TT-E-529	TT-P-1511	Type II: White and tints.
Odorless	Semigloss	Alkyd	TT-E-543[*]	TT-E-509[*]	White and tints.
	Gloss		TT-E-543[*]	TT-E-503[*]	White and tints.
Heavy duty	Clear	Urethane	TT-C-542	TT-C-542	Do not use below 30% relative humidity.
		Phenolic	TT-V-119[*]	TT-V-119[*]	Do not use on light colored wood--tends to yellow.
	Gloss	Epoxy	TT-C-535[7]	TT-C-535[*]	Two component--limited pot life. White and tints.
		Urethane	TT-C-542	TT-C-542	Do not use below 30% humidity. Five colors.
	Gloss	Not specified	TT-C-550	TT-C-550	Tile-like surface, white and colors. All components must be compatible and from the same manufacturer (See FSCM 09806).

*1 or 2 coats as required.

KEY

[*] revision of specification recommended

[7] recommendation unknown

cancellation of specification recommended

[*] complies with SCAQMD Rule 1113 but not Rule 1107

specification has been cancelled

TABLE 10. Recommended Coating Systems for Interior Concrete and Masonry

Use	Finish	Binder Type(s)	Primer*	Topcoat*	Notes
General Purpose ..	Flat	Latex + alkyd ...	TT-P-29	TT-P-30	White and tints.
		Latex	TT-P-29	TT-P-29	White and tints
		Latex	TT-P-29 or TT-P-1728	TT-P-1728	Deep tones.
	Semigloss	Latex + alkyd ...	TT-P-29	TT-E-508[?]	White and tints.
		Latex + latex ...	TT-P-29	TT-P-1511	Type I: white and tints.
	Gloss	Latex + alkyd ...	TT-P-29	TT-E-506[a,†]	White and tints.
		Latex + latex ...	TT-P-29	TT-P-1511	Type II: white and tints.
Odorless	Flat	Latex + alkyd ...	TT-P-29	TT-P-30	White and tints.
		Latex	TT-P-29	TT-P-29	White and tints.
	Semigloss	Latex + alkyd ...	TT-P-29	TT-E-50[a,†]	White and tints.
	Gloss	Latex + alkyd ...	TT-P-29	TT-E-506[a,†]	White and tints.
Moisture Resistant	Flat	Rubber	TT-P-95	TT-P-95	Class 3, white and tints.
	Semigloss	Rubber	TT-P-95	TT-P-95	Class 2, white and tints.
	Gloss	Rubber	TT-P-95	TT-P-95	Class 1, white and tints.
Moderately Heavy Duty	Flat	Latex	MIL-P-28643 ...	MIL-P-28643	White and tints for family housing
Heavy Duty	Gloss	Epoxy	TT-C-535[?]	TT-C-535[?]	Two component, limited pot life. White and tints.
		Urethane	TT-C-542	TT-C-542	Do not use below 30% relative humidity. Wide range of colors.
	Gloss	Not specified ...	~~TT-C-550~~**	~~TT-C-550~~**	Tile-like surface. White and colors. All components must be compatible and from the same manufacturer (Box FCCB 09806).
	Flat, textured	Not specified ...	TT-C-535		Type I: Used to hide surface irregularities on ceilings.

* Note: Use block filler if a smooth finish is desired on a rough substrate before applying primer.
** 1 or 2 coats are required.
a Apply 1 intermediate coat of TT-E-543 and 1 top coat of enamel.
b Apply 1 intermediate coat of TT-E-543 and 1 top coat of enamel.

KEY
- [ ]+ revision of specification recommended
- [ ]? recommendation unknown
- [=] cancellation of specification recommended
- [ ]* complies with NCAQMD Rule 1113 but not Rule 1107
- ——— specification has been cancelled

TABLE II. Recommended Coating Systems for Interior Metal

Use	Finish	Binder Type(s)	Primer*	Topcoat*	Notes
General purposes .	Semigloss	Alkyd	TT-P-645†	TT-E-508[a]†	White and tints.
	Gloss	Alkyd	TT-P-645†	TT-E-506[a]†	White and tints.
	Gloss	Alkyd	TT-P-645†	TT-E-489[b]†	White and colors.
	Aluminum	Alkyd + phenolic.	TT-P-645†	TT-P-38	Ready-mixed.
Odorless	Semigloss	Alkyd		TT-E-509[a]†	White and tints.
	Gloss	Alkyd	TT-P-645†	TT-E-505[b]†	White and tints.
Moisture Resistant	Semigloss	Rubber	TT-P-1046	TT-P-95***†	Class 2, white and tints.
	Gloss	Rubber	TT-P-1046	TT-P-95***†	Class 1, white and tints.
Heavy Duty	Gloss	Epoxy	**	TT-C-535†	Two component, limited pot life. White and tints.
		Urethane	**	TT-C-542	Do not use below 30% relative humidity. Wide range of colors.
Aluminum finish		Oleo. + phenolic	TT-P-659	TT-P-38	Ready mixed.
		Oleoresinous	TT-P-649	TT-P-320, + TT-V-81	2 lbs per gallon mixed just before use.

*Use pretreatment DOD-P-15328 on nonferrous metals.
**1 or 2 coats as required.
***2 or 3 coats as required.
[a]Apply 1 intermediate coat of TT-E-543 and 1 top coat of enamel.
[b]Apply 1 intermediate coat of TT-E-543 and 1 top coat of enamel.

KEY
- † revision of specification recommended
- ? recommendation unknown
- cancellation of specification recommended
- * complies with SCAQMD Rule 1113 but not Rule 1107
- ——— specification has been cancelled

TABLE 12. Recommended Coating Systems for Interior Plaster and Wallboard

Use	Finish	Binder Type(s)	Primer Plaster	Primer Wallboard	Topcoat*	Notes
General purpose ..	Flat	Latex.....	TT-P-29	TT-P-650**	TT-P-29	White and tints.
			MIL-P-28643 ...	TT-P-650	MIL-P-28643 ..	White and tints for moderately heavy duty.
				TT-P-650**	TT-P-1720	Deep tones.
	Semigloss	*** + alkyd ...	TT-S-179[†]	TT-P-650**	TT-E-508[‡] ..	White and tints.
		*** + latex ...	TT-S-179[†]	TT-P-650**	TT-P-1511	Type I: White and tints.
	Gloss	*** + alkyd ...	TT-S-179[†]	TT-P-650**	TT-P-506[‡] ..	White and tints.
		*** + latex ...	TT-S-179[†]	TT-P-650**	TT-P-1511	Type II: White and tints.
Odorless	Flat	Latex	TT-P-29	TT-P-650**	TT-P-29	White and tints.
		*** + alkyd ...	TT-S-179[†]	TT-P-650**	TT-P-30	White and tints.
	Semigloss	*** + alkyd ...	TT-S-179[†]	TT-P-650**	TT-E-509[‡] ..	White and tints.
	Gloss	*** + alkyd ...	TT-S-179[†]	TT-P-650**	TT-E-505[‡] ..	White and tints.
Moisture resistant	Flat	Rubber	TT-P-95[c][†]	TT-P-95[c][†]	TT-P-95[†]	Class 3, white and tints.
	Semigloss	Rubber	TT-P-95[c][†]	TT-P-95[c][†]	TT-P-95[†]	Class 2, white and tints.
	Gloss	Rubber	TT-P-95[c][†]	TT-P-95[c][†]	TT-P-95[†]	Class 1, white and tints.

*1 or 2 coats as required.
**TT-P-29 may be substituted.
***Primer for plaster-oil or wallboard-latex
[a]Apply 1 intermediate coat of TT-E-543 and 1 top coat of enamel.
[b]Apply 1 intermediate coat of TT-E-545 and 1 top coat of enamel.
[c]Use Class 3, flat, for prime coat.

KEY
- [*] revision of specification recommended
- [†] recommendation unknown
- cancellation of specification recommended
- [•] complies with NCAQMD Rule 1113 but not Rule 1107
- specification has been cancelled

TABLE 13. Recommended Coating Systems for Exterior Wood

Use	Finish	Binder Type(s)	Primer*	Topcoat*	Notes
General purpose ..	Flat	Alkyd + latex ...	MIL-P-28582+¶	TT-P-19	White and colors.
	Flat	Alkyd + alkyd-latex	MIL-P-28582†	TT-P-1510	White and colors.
	Gloss	Alkyd + oil	MIL-P-28582†	TT-P-81†	Medium shades.
	.....	.....	MIL-P-28582†	~~MIL-P-28584~~	Blister resistant; white and tints.
	.....	Alkyd + alkyd ...	MIL-P-28582†	TT-P-102†	Lead free, white and tints.
Trim paint	Gloss	Alkyd + alkyd	MIL-P-28582	~~TT-P-37~~	Deep colors.
Shakes and Shingles	Flat	Oil	TT-S-708†	TT-S-708†	Semitransparent colors.
	.....	Latex	TT-S-1992	TT-S-1992	Wide range of colors.
	Semigloss	Alkyd-oil	TT-P-52†	TT-P-55†	White and colors.
Plywood	.....	Latex	TT-P-1984	TT-P-19	First seal with TT-S-176.
		Latex + Alkyd-latex		TT-P-1510***	White and colors.
		Latex	TT-S-1992	TT-S-1992	Wide range of colors. For previously stained surfaces use TT-S-1992.
Industrial areas ..	Gloss	Alkyd	MIL-P-28582	TT-P-102	Lead free. White and tints.
		Alkyd	MIL-P-28582	~~MIL-P-28584~~	Lead free. White and tints.

*1 or 2 coats as required.
**Use TT-P-1984 as the primer for an all latex system.
***For better adhesion to previously painted surfaces, use TT-P-1510 as a latex topcoat.

KEY
- ¶ revision of specification recommended
- † recommendation unknown
- ~~cancellation~~ of specification recommended
- * complies with SCAQMD Rule 1113 but not Rule 1107
- ~~specification has been cancelled~~

TABLE 14. Recommended Coating Systems for Exterior Concrete and Masonry

Use	Finish	Binder Type(s)	Primer***	Topcoat*	Notes
General purpose ...	Flat	Latex (acrylic) ...	TT-P-19**	TT-P-19	White and colors. Resistant to chalking and fading.
	.....	Latex (PVAc)	~~TT-P-55**~~	~~TT-P-55~~	Type II: White and colors. Resistant to chalking and fading.
	.....	Rubber	~~TT-P-97~~	~~TT-P-97~~	White, solvent thinned.
	.....	.....	TT-P-1181	TT-P-1181	Colors, solvent thinned.
High humidity and Moisture	Gloss	Rubber	TT-P-95**** ...	TT-P-95	Class 1, White and tints. Can be used for swimming pools.
	Semigloss	Rubber	TT-P-95****† ...	TT-P-95†	Class 2, White and tints. Can be used for swimming pools.
	Flat	Vinyl	MIL-P-28641† ...	MIL-P-28642†	High build vinyl.
		Rubber	TT-P-95****† ...	TT-P-95†	Class 3, White and tints. Can be used for swimming pools.
Textured finish ...	Flat	Not specified	TT-P-1098	TT-C-555	Type II: Heavy bodied coating that can hide surface irregularities.
Corrosive environment (Bulkhead, etc.)	Semigloss	Vinyl	VR-3†	VR-3†	Use 4 coats for best performance. 4 colors.

*1 or 2 coats as required.
**Use fill coats if necessary. See specification.
***Use TT-P-620 on prepared chalky surfaces.
****Use Class 3 for prime coat.

KEY
† revision of specification recommended
† recommendation unknown
cancellation of specification recommended
* complies with SCAQMD Rule 1113 but not Rule 1107
specification has been cancelled

TABLE 15. Recommended Coating Systems for Exterior Iron and Steel

Environment	Substrate	Preparation*	Binder Type(s)	Primer	Topcoat**	Notes
Rural	Structural ..... (rough)	Class 1	Oil-alkyd+alkyd ...	TT-P-86, Type II	TT-P-102‡ ...	White and tints.
				TT-P-86, Type II	~~MIL-P-24384~~.	White and tints.
				TT-P-86, Type II	TT-P-61	Medium colors.
			Oil-alkyd+alkyd ..	~~TT-P-59~~, Type I	TT-P-61	Deep colors.
			Oil-alkyd+phenolic	~~TT-P-59~~, Type I	TT-P-38	Aluminum, ready mixed.
	Smooth	Class 3	Alkyd+alkyd	~~TT-P-59~~, Type II, or	TT-E-489‡ ... or	High gloss, all colors.*****
			:	TT-P-86, Type II, or	TT-E-490‡ ... or	Semigloss, very durable silicone-alkyd, white and 12 colors.
			or silicone-alkyd	~~TT-P-645~~†	TT-E-1593 ..	Gloss, durable silicone-alkyd white and 19 colors.*****
			Latex	MIL-P-28577 .	MIL-P-28578.	White and tints.
Sulfide fumes .	Structural	Class 1	Oil+oil	TT-P-86, Type I	TT-P-102 ...	White and tints.
High humidity or heavy rainfall	Structural ..... or smooth	Class 3	Phenolic+alkyd	~~TT-P-53~~, Type III or	TT-E-489‡ ... or	Alkyd enamel, all colors.*****
			Phenolic+silicone-alkyd	~~TT-P-1757~~	TT-E-490‡ ... or	Semigloss
					TT-E-1593	Gloss
			Phenolic+chlorinated rubber		TT-P-91† Type I	Rubber base, white and tints.

KEY

‡ revision of specification recommended

† recommendation unknown

cancellation of specification recommended

* complies with SCAQMD Rule 1113 but not Rule 1107

specification has been cancelled

TABLE 15. Recommended Coating Systems for Exterior Iron and Steel--Continued

Environment	Substrate	Preparation*	Binder Type(s)	Primer	Topcoat**	Notes
Fresh water immersion			Vinyl	SSPC Paint No. 9 or VR-3 ?	SSPC Paint No. 9 or VR-3 ? †	Aluminum white, 4 coat systems
			Epoxy	MIL-P-24441/1	MIL-P-24441/7*/3 *	4 coat systems
Marine or mildly corrosive	Structural	Class 2 or 3	Same as rural	See rural but use 2 coats of primer.	Same as rural	
	Smooth	Class 3	Same as rural			
Marine or moderately corrosive	Structural	Class 3	Vinyl	MIL-P-28461 †, TT-P-641, Type II or III *	MIL-P-28462 †, TT-E-490 ...	High build vinyl
	Smooth	Class 3	alkyd or phenolic+ silicone-alkyd			Semigloss, very durable silicone-alkyd, white and 13 colors.*****
					TT-E-1593 ..	Gloss, very durable silicone-alkyd, white and 19 colors.
						Gloss, durable silicone-alkyd, white and 11 colors.*****
Marine	Structural	Class 4	Vinyl.....	VR-3, 4 coat system ?		See Appendix B-1, Table 4.
Immersion or highly corrosive			Vinyl	VR-6, 4 coat system ?		See Appendix B-1, Table 4.
			Inorganic Zinc+Vinyl	MIL-P-23236, Class 3 *		
			Epoxy+Urethane	MIL-P-23377 Type I ?	MIL-C-81773 †	Processed in accordance with MIL-C-81907.

*See 4.4.2.7
**Use 2 coats on new work, then 1 or 2 coats as required.
***Tie coat may be required.
****See Appendix B-1, Table 4 for other gray munsells of similar formulation.
*****Suitable for use as colors in obstruction markings.

KEY
- * revision of specification recommended
- ? recommendation unknown
- cancellation of specification recommended
- * complies with SCAQMD Rule 1113 but not Rule 1107
- ——— specification has been cancelled

TABLE 16. Recommended Systems for Exterior Metal (Non-Ferrous and Misc.)

Substrates	Preparation	Pretreatment*	Primer	Top coat**	Notes
Aluminum	Clean and deoxidize per ASTM D 629; or abrade with MIL-A-9962 abrasive mats and solvent clean	MIL-C-81706 Class 1A	TT-P-645† ...	Same as for iron and steel depending on environment and desired finish	Generally not painted. Select appropriate clear finish to prevent staining, e.g., Incralac, International Copper Research Assn., Inc.
Copper and copper alloys, including brass	Solvent clean as per TT-C-490, method 2	MIL-P-15328	TT-P-645†	Same as for iron and steel depending on environment and desired finish.	Generally not painted. Select appropriate clear finish to prevent staining, e.g., Incralac, International Copper Research Assn., Inc. Patina may be removed if desired by TT-C-490, method 1 and MIL-M-10510, type I.
Lead	Solvent clean, if new; otherwise clean 1	MIL-P-15328	TT-P-645†	As above.....	Generally not painted.
Tin, and terne plate	Solvent clean, if new, otherwise, clean 1	MIL-P-15328	TT-P-645†	As above.....	Generally not painted.
Miscellaneous metal finishes (special purpose)	.....	.....	.....	.....	See MIL-STD-171, and MIL-HDBK-132 for preparation, pretreatment and coating.
Galvanized steel	As above	As above	TT-P-641***†	As above	Two coats should be adequate for rural environment.
Chain link fencing	Clean 1			TT-P-641 ..* MIL-P-[illegible]* TT-P-[illegible] ..*	Gray finish Gray finish Aluminum finish
Screen and wire cloth	.....			TT-V-119 ..† TT-E-[illegible]†	Clear finish Black enamel

*See 4.6.6.3

**Use 2 coats on new work, then 1 or 2 coats as required.

***Can be used without pretreatment

KEY

† revision of specification recommended

† recommendation unknown

cancellation of specification recommended

* complies with SCAQMD Rule 1113 but not Rule 1107

specification has been cancelled

TABLE 17. Recommended Coating Systems for Wood Floors*

Use	Finish	Binder type(s)	Exposure	Primer	Top coat*	Notes
General Purpose	Clear	Oleoresinous	Interior			
				~~TT-S-176~~ ..	~~TT-S-176~~ ..	Penetrating sealer, low gloss finish.
	Gloss	Not specified	Interior or exterior	TT-E-487† ..	TT-E-487† ..	Eight colors, not for damp areas.
Humid, marine .	Clear	Phenolic	Interior	~~TT-S-176~~ ..	TT-V-119† ..	Excellent water resistance.
	Semigloss .	Alkyd-phenolic	Interior or exterior	~~DOD-P-6981~~ .	~~DOD-P-6981~~ .	Black.
				~~DOD-P-699~~ .	~~DOD-P-699~~ .	Gray.
				~~DOD-P-18210~~	~~DOD-P-18210~~	Red.
	Not specified	Alkyd	Interior	~~DOD-P-18214~~	~~DOD-P-18214~~	Dark green.
Heavy duty ...	Clear	Urethane	Interior	TT-C-542, Type 1, Class 1 ?	TT-C-542, Type 1, Class 1 ?	Slow dry at low humidity, excellent abrasion and chemical resistance.
	Clear	Not specified	Interior	~~TT-S-176~~ ..	MFMA**	For gymnasium floors.
Non-skid	Rough	Urethane	Interior	TT-C-542, Type II °	TT-C-542, Type II °	Add abrasive chips for nonskid paint.

*If a filler is used prior to primer/top coat application, make sure that the filler is cured and that it is compatible with the primer/top coat. Use 2 coats on new work.
**Heavy duty finishes for maple, beech, and birch floors--Maple Flooring Mfrs. Assoc.

KEY
† revision of specification recommended
? recommendation unknown
~~ cancellation of specification recommended
° complies with SCAQMD Rule 1113 but not Rule 1107
——— specification has been cancelled

TABLE 18. Recommended Coating Systems for Coating Floors*

Use	Finish	Type	Exposure	Primer	Top coat	Notes
General purpose	Gloss	Not specified	Interior or exterior ..	TT-E-487† ..	TT-E-487† ..	Four colors, not for damp areas.
		Rubber	Interior	TT-P-91† ..	TT-P-91† ..	Eight colors, fast dry, resistant to cleaners, mild acid and alkali, abrasion.
Heavy duty and nonskid	Rough	Urethane	Interior	TT-C-542, Type II.*	TT-C-542, Type II.*	Slow dry at low humidity, excellent abrasion and chemical resistance. Add abrasion chips for nonskid paint.
Damp environments	Rough	Coal tar-epoxy	Interior	SSPC no. 16	SSPC no. 16	Two component; black and dark red; apply on dry substrate. Use with garnet. Modeled after C or E Formula C-200.

*Concrete floors shall not be painted except as necessary for functional needs, e.g., safety, special illumination.

KEY

† revision of specification recommended

‡ recommendation unknown

— cancellation of specification recommended

* complies with SCAQMD Rule 1113 but not Rule 1107

——— specification has been cancelled

TABLE 19. Recommended Coating Systems for Metal Floors

Use	Finish	Binder Type(s)	Exposure	Primer	Top coat*	Notes
General purpose **	Semigloss	Alkyd	Interior	TT-E-485 ?	TT-E-485 + ...	Type II Roller.
	Not specified	Alkyd+alkyd-phenolic	Interior	~~TT-P-57, Type II or~~	~~DOD-P-15328~~	Red.
	Semigloss		Interior or Exterior	TT-P-86 Type III	~~DOD-E-8042~~ ..	Dark green Black
					DOD-E-699 ..	Gray.
	Not specified	Not specified				
Damp and mildly corrosive environments	Smooth	Not specified	Interior or Exterior	TT-P-615, Type III	MIL-M-3044 ? Type I	6 colors, for walkways
Heavy duty	Not specified	Urethane	Interior	TT-C-542 Type II *	TT-C-542, Type II *	Slow dry at low humidity, 4 colors, excellent abrasion and chemical resistance.
Corrosive environments	Rough	Coal tar-epoxy ...	Interior		SSPC No. 16	Two component; Black and dark red. Use with garnet. Modeled after C of E Formula C-200.
Nonskid	Rough	Phenolic	Interior	~~MM-P-53, Type III~~ or TT-C-542, Type II *	MIL-M-3044 ? Type II TT-C-542, Type II *	6 colors, for walkways. With abrasive chips added, 4 colors.
	Rough	Urethane	Interior			

*Use 2 coats on new work.
**For damp and mildly corrosive environments, use TT-P-57, type III, or TT-P-86, type IV, or TT-P-615, type III for primers.

KEY
- + revision of specification recommended
- ? recommendation unknown
- ~~ cancellation of specification recommended
- * complies with DCAPRD Rule 1113 but not Rule 1107
- ——— specification has been cancelled

Appendix C. Suggested Replacements for Non Compliant Coatings Recommended in AFM 85-3

The criterion used for replacement of non-compliant coatings with compliant ones was that the coatings meet SCAQMD Architectural Coatings Rule 1113. Some of the replacement coatings do not meet SCAQMD's Coating of Metal Parts and Products Rule 1107. These coatings include MIL-P-24441 and TT-C-542, which are recommended in many of the selection tables. In addition there are no exemptions for specialized coatings in Rule 1107. Thus, TT-P-95 would not be compliant for use in swimming pools and most metallic pigmented coatings would not comply.

TABLE 9. Recommended Coating Systems for Interior Wood

Use	Finish	Binder Type	Primer	Topcoat	Notes
General Purpose	Clear	Phenolic Latex	TT-V-119*	TT-V-119*	Substitute commercially available material
	Stain	Latex	Substitute commercially available material		
	Semigloss	Latex	TT-P-1511	TT-P-1511	Type I: White and tints.
		Latex	Substitute commercially available material		Wide range of mid and deep tones
	Gloss	Latex	TT-P-1511	TT-P-1511	Type II for topcoat: White and tints.
		Latex	Substitute commercially available material		Wide range of mid and deep tones
Heavy duty	Semigloss	Latex	TT-P-1511, type I	MIL-P-28578	Do not use in damp, humid exposures
	Other	Use materials listed above; data on performance of other high performance compliant coatings on wood for heavy duty use are not available			

*Although TT-V-119 is not now VOC compliant, the specification is scheduled to be revised to make it compliant

TABLE 10. Recommended Coating Systems for Interior Concrete and Masonry

Use	Finish	Binder Type	Primer	Topcoat	Notes
General Purpose	Flat	Latex	TT-P-29	TT-P-29	White and tints
		Latex	TT-P-29	TT-P-1728	Deep Tones
	Semigloss	Latex	TT-P-1511	TT-P-1511	Type I: White and tints
	Gloss	Latex	T-P-1511	TT-P-1511	Type I for primer, Type II for topcoat, white and tints
Moderately heavy duty	Semigloss	Latex	MIL-P-28578	MIL-P-28578	Wide range of colors
Moisture resistant resistant or heavy duty	Semigloss	Epoxy	MIL-P-24441	MIL-P-24441	White and some colors, check full spec for colors, apply only to clean bare substrate
Textured	Flat	Not specified	TT-C-555		Type I: Used to hide surface irregularities on ceilings

TABLE 11. Recommended Coating Systems for Interior Metal

Use	Finish	Binder Type	Primer	Topcoat	Notes
General Purpose	Semigloss	Latex	MIL-P-28577	MIL-P-28578	Wide range of colors
Moisture resistant and heavy duty	Semigloss	Epoxy	MIL-P-24441	MIL-P-24441	Two-component coating, see full spec. for available colors
	Gloss	Epoxy + urethane	MIL-P-24441	commercially available high solids urethane	Two-component materials

TABLE 12. Recommended Coating Systems for Interior Wallboard

Use	Finish	Binder Type	Primer	Topcoat	Notes
General Purpose	Flat	Latex	TT-P-650	TT-P-29	White and tints
		Latex	TT-P-650	TT-P-1728	Deep tones
	Semigloss	Latex	TT-P-650	TT-P-1511	Type I: White and tints
		Latex	TT-P-650	Commercially available pts.	Mid-and Deep tones
	Gloss	Latex	TT-P-650	TT-P-1511	Type II: White and tints
		Latex	TT-P-650	Commercially available pts.	Mid-and Deep tones
Moisture resistant	No recommendations are made since TT-P-95 and similar type rubber coatings are not compliant for this use and data on performance of high performance compliant coatings for use on wall board are not available.				

TABLE 13. Recommended Coating Systems for Exterior Wood

Use	Finish	Binder Type	Primer	Topcoat	Notes
General Purpose	Flat	Latex	TT-P-1984	TT-P-19	White and colors
	Semigloss	No government specifications are available. Use commercially available latex paints for white, light, mid- and deep tone colors.			
	Gloss	No government specifications are available for compliant materials. Use semigloss paints in place of gloss paints			
Trim paint	Semigloss	No government specifications are available. Use commercially available latex paints for trim paints.			
Shakes and shingles	Flat	Latex	TT-S-1992	TT-S-1992	Wide range of colors
Plywood	Flat	Latex	TT-P-1984	TT-P-19	White and colors
	Semigloss	Latex	TT-P-1984	Use commercially available paint	Available in a wide range of colors
Industrial areas	Use recommendations given above.				

TABLE 15. Recommended Coating Systems for Exterior Iron and Steel

Environment	Substrate	Preparation	Binder	Primer	Midcoat	Topcoat	Notes
Rural, marine or corrosive*	Structural	Tool cleaned	Alkyd + latex	TT-P-645**		MIL-P-28578	Use for existing film having only minor defects
	Structural	SSPC-SP 6*	Epoxy-zinc + epoxy + latex	MIL-P-24441, For. 159	MIL-P-24441, For. 150	MIL-P-28578	Use when removal of existing film by abrasive blasting is required
	Smooth	Tool cleaned	Alkyd + latex	MIL-P-645**		MIL-P-28578	Use over previously p'ted steel or bare non-corroded galvanized
	Smooth	SSPC-SP 6	Epoxy-zinc + epoxy + latex	MIL-P-24441, For. 159	MIL-P-24441, For. 152	MIL-P-28578	Use when steel is rusted, including galvanized
Marine or corrosive	Structural	SSPC-SP 10	Epoxy-zinc + urethane	MIL-P-24441,		High solids urethane***	System will be harder to maintain than latex topcoat system
	Structural	SSPC-SP 10	Epoxy	MIL-P-24441, For. 159 or For. 150	MIL-P-24441, For. 152	MIL-P-24441	System will chalk in sunlight, choose light color for topcoat
Fresh water immersion	Structural	SSPC-SP 10	Epoxy	MIL-P-24441, For. 151	MIL-P-24441, For. 157	MIL-P-24441, For. 153	

*Recommended systems are similar for all atmospheric environments because high performance coating are cost-effectiv in rural as well as more corrosive environments and VOC compliant coatings are generally limited to high build urethanes, epoxies and water-based materials.

**Although TT-P-645 as presently written is not VOC compliant (SCAQMD Rule 1113), work is underway to revise the specification to make it compliant.

***VOC compliant materials are available, although there is no government purchasing document at this time.

TABLE 16. Recommended Coating systems for Exterior Non-Ferrous and Miscellaneous Metal

Substrate	Preparation	Pretreatment	Primer	Topcoat	Notes
Aluminum	Solvent clean* to remove grease and oil. Clean by water blasting or water/abrasive blasting to remove surface contamination		MIL-P-24441, For. 150	High soilds urethane**	Generally not painted except in marine or highly corrosive environments
Copper and copper alloys, brass	Clean to remove surface contaminates	Wash primer is not compliant	Recommendations are not made because of lack of performance data on VOC compliant coatings		Generally not painted
Lead	Clean to remove surface contaminates	Wash primer is not compliant	Recommendations are not made because of lack of performance data on VOC compliant coatings		Generally not painted
Tin, and tern plate	Clean to remove surface contaminates	Wash primer is not compliant	Recommendations are not made because of lack of performance data on VOC compliant coatings		Generally not painted
Chain link fencing	Water blast to remove surface contaminates, if necessary	None	MIL-P-24441, MIL-P-28578 For. 159		

*Check with local bio-environmental office for rules regarding solvent cleaning

**VOC compliant materials are available, although there is no government purchasing document at this time.

TABLE 17. Recommended Coating Systems for Interior Wood Floors

Use	Finish	Binder Type	Primer	Topcoat	Notes
General purpose, heavy duty, and marine*	Clear	Phenolic	TT-V-119**	TT-V-119**	Excellent water resistance
	Gloss	Not specified	TT-E-487**	TT-E-487**	Not for use in damp areas
	Semigloss	No government specifications are available for high performance systems			
Non-skid	Rough	Urethane	TT-C-542, Type II	TT-C-542, Type II	Add abrasive chips for nonskid paint

*Many of the specifications materials traditionally used to coat floors are not VOC compliant. Hence, there are not different recommendations for these three uses.

**Although TT-V-119 and TT-E-487 are not compliant, revision of the specifications is planned to make them compliant. If compliant materials are needed before the revision is complete, use locally procured materials.

TABLE 18. Recommended Coating systems for Interior Concrete Floors

Use	Finish	Binder Type	Primer	Topcoat	Notes
General purpose, and heavy duty	Gloss	Not specified	TT-E-487*	TT-E-487*	Not for use in damp areas
		Urethane	TT-C-542, Type II	TT-C-542, Type II	Add abrasive chips for nonskid paint

* Revision of specification is planned to make TT-E-487 VOC compliant

TABLE 19. Recommended Coating systems for Metal Floors

Use	Finish	Binder Type	Primer	Topcoat	Notes
General Purpose		Alkyd	Not presently available using government specifications		
Heavy Duty		Urethane	TT-C-542, Type II	TT-C-542, Type II	Excellent abrasion and chemical resistance slow dry at low humidity, difficult to recoat
Non-skid	Rough	Urethane	TT-C-542, Type II	TT-C-542, Type II	Add abrasive chips for non-skid
		Epoxy	MIL-P-24441, For. 150	DOD-D-24667	Use grit of suitable size

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The Effect of Volatile Organic Content Regulations on the Selection and Use of Coatings Included in AFM 85-3 (Tri-Service Paints and Protective Coatings Manual)

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